

**Title:** **Evaluation of Erosion Hazards – United States shoreline  
(Atlantic, Gulf, Pacific and Great Lakes)**

**Contact(s):** Name: Steve Dunn  
Agency: The Heinz Center  
1001 Pennsylvania Ave, NW Suite 735 South  
Washington, D.C. 20004  
Phone: (202) 737-6307  
Fax: (202) 737-6410  
E-mail: sdunn@heinzctr.org

**Hazard examined:** Coastal erosion

**Study emphasis:** Economic development, land use planning in coastal areas, setting flood and erosion insurance premium rates and cost effectiveness of shoreline protective measures.

**Summary:** Offers a set of policy options reflecting a range of possible responses to erosion hazards including, but not limited to, creation of coastal high hazard zones, surcharges on flood insurance and/or regulatory measures for current and future structures located within erosion zones, erosion insurance and relocation assistance and/or land acquisition and shoreline protective measures.

---

**Vulnerability Indicators:** Property (land, buildings) within 60-year erosion hazard areas

**Economic Development, Disaster Preparedness, Disaster Response and/or Disaster Reconstruction Application:** Land use planning in coastal areas, setting flood and erosion insurance premium rates, cost effectiveness of shoreline protection measures.

**Data Requirements:**

The study was conducted in three phases. In phase 1, the Federal Emergency Management Agency contracted with state agencies to produce maps for 27 counties along U.S. coastlines to map the following features:

- 60-year EHAs, calculated by multiplying erosion rates at each site by 60 years;
- Current Flood Insurance Rate Map (FIRM)-based flood zones, including V-zone/A-zone boundaries and some A-zone/X-zone boundaries, both with associated base flood elevations (BFEs) and gutter lines (i.e., contour lines within flood elevations that separate areas with different BFEs); and
- 60-year projected FIRM-based flood zones. These zones were determined by projecting the current FIRM-based flood zones landward by approximately the distance that the beach is expected to erode during the next 60 years (i.e., the width of the 60-year EHA).

The Heinz Center conducted phases 2 and 3, which included a field survey of over 10,000 structures and analyses of the extent of erosion-related damage and options to address that damage.

Using the 60-year projected erosion hazard zones, the number of structures in each EHA was approximated for all 27 counties. The Heinz Center's subcontractor, Spatial Data Institute, conducted field survey measurements of 11,234 structures in or near 60-year EHAs. Because of cost constraints and the limited availability of assessment data on structures, field surveys were conducted in only 18 of the 27 counties (see Figure 1.). All geographic regions of the United States were represented in the study.

Structures were sampled within representative sampling transects distributed throughout the entire length of mapped coastline.<sup>1</sup> The transects included both eroding and non-eroding areas, as well as varying flood heights and zone designations (e.g., V-zone, A-zone, and X-zone). Using the Global Positioning System and conventional survey techniques, the surveyors located the latitude and longitude coordinates of each structure accurate to within 3 feet and the vertical elevation of the lowest floor accurate to within 6 inches.

Detailed structure and parcel attribute information was obtained from each local government's tax assessment office. This information was combined with the field survey data and plotted on the 60-year EHA maps in a geographic information system.

The NFIP policies in force and claims data from the Federal Insurance Administration for the 27 counties mapped by FEMA also were obtained. Detailed property attributes, such as sales price and interior features, were acquired through a mail survey of owners of field-surveyed properties. Finally, a database of coastal erosion rates and census block groups adjoining open-ocean coastlines nationwide was developed to extrapolate nationwide erosion losses and the effects of policy changes on the NFIP and coastal communities.

---

<sup>1</sup> Two counties, Sussex, DE and Glynn, GA, were selected as pilot tests for the field survey work and were sampled in their entirety.



FIGURE 1. Counties studied in evaluation of erosion hazards and average annual erosion rates (feet/year).

**Output:** The Heinz Center focused on analyzing the impacts of erosion and the effects of policy changes on the NFIP and coastal communities. The economic impact analysis included two major components: estimates of the impacts of erosion and evaluation of the impacts of possible changes in the cost and availability of flood insurance within the mapped EHAs. The first component answers the question, “How big a problem is coastal erosion?” The second component develops the “building blocks” needed to address the options suggested by the U.S. Congress in Section 577. The analysis of the impacts of erosion considered the following elements:

- value of the structures damaged by erosion,
- National Flood Insurance Fund (NFIF) compensation to policyholders for erosion-related flood losses, and
- changes in the value of residential and commercial properties in communities with erosion hazards.

The following set of policy options or “packages” (some dependent on mapping and others not), reflecting a range of possible responses to erosion hazards as broadly defined by Section 577, were evaluated:

1. maintain the status quo (i.e., no change in policy);
2. erosion mapping and dissemination alone;
3. creation of a coastal high hazard zone, including both high flood and erosion zones;
4. mandatory erosion surcharge on flood insurance in erosion zones;
5. erosion surcharge combined with regulatory measures to reduce damages;
6. flood-related regulatory changes in erosion zones;
7. erosion insurance in bluff areas susceptible to erosion but not flooding;
8. relocation assistance and/or land acquisition; and
9. shoreline protection measures (i.e., nourishment, dune restoration, and structural measures).

For each of the eight policy alternatives to the status quo, the three types of economic impacts listed above were evaluated and compared with the impacts of erosion under current policies and management regimes.

**Results of Application at Case Study Site:** The final report will be submitted to FEMA and Congress in Spring, 2000. Findings will be disseminated to coastal zone managers, researchers, policymakers, and the interested public through participation in conference workshops, popular magazine articles, and electronic communications.

**Lessons Learned:** The dynamic nature of the shoreline makes it difficult to accurately assess a community's risk and vulnerability. Extreme storm events can cause rapid, episodic erosion that can move the shoreline hundreds of feet inland, followed by an extended period in which the beach accretes back, but not completely, to its former position. These episodic events can greatly increase a community's risk of damage. Further, future projections of shoreline position reflect past sea level rise, but do not reflect future rates of sea level rise, which may accelerate because of global climate change. Conversely, communities respond to the erosion hazard by constructing shoreline protection projects (e.g., beach nourishment, seawalls, dune restoration), thus lowering their vulnerability.